UPDATING THE GEOGRAPHIC PRACTICE COST INDEX: REVISED COST SHARES

Final Report

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May 1994

This report was prepared under Contract No. 500-89-0050 from the Health Care Financing Administration to Health Economics Research, Inc. The assistance of our HCFA Project Officer, Sherry Terrell, Ph.D., is gratefully acknowledged. The statements contained in this report are solely those of the authors and do not necessarily reflect the views or policies of the Health Care Financing Administration. The contractor assumes responsibility for the accuracy and completeness of the information contained in this report.

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EXECUTIVE SUMMARY

The Geographic Practice Cost Index (GPCI) is used in adjusting Medicare Fee Schedule payments for regional variations in physicians' cost of practice. The GPCI is an input price index that measures the relative cost of a standard market basket of physician practice inputs across areas. The Laspeyres index number form chosen for the GPCI requires two basic components: national shares of each practice input in total practice costs and relative price terms for each area. The practice expense shares, which include physician net income as the "cost" of physician time, are often referred to simply as "cost shares." GPCI index values for each area are calculated by weighting the relative price terms by the national cost shares to form an average relative price for practice inputs in each area.

The current (1992) GPCI's cost shares were calculated using 1987 data from the American Medical Association's (AMA) Socioeconomic Monitoring System (SMS). The current cost shares are shown in the first column of Table ES-1. Mean physician net income and practice overhead expenses for self-employed physicians, as published in the AMA's Socioeconomic Characteristics of Medical Practice, were utilized. Six overhead cost components were distinguished: nonphysician employee compensation, office rental, malpractice insurance premiums, medical equipment, medical supplies, and other (miscellaneous).

The Health Care Financing Administration (HCFA) contracted with Health Economics Research, Inc. (HER) to update the GPCI, including its cost shares. This report reviews the construction of the GPCI cost share. HER recommended, and HCFA agreed, that the revised (1996) GPCI cost shares be based on the Medicare Economic Index (MEI) cost shares calculated by HCFA's Office of the Actuary. Promulgated in 1975, the MEI has been used to construct the annual market basket update for Medicare physician payments. Thus, the cost shares of HCFA's two major indices of physician input prices will be consistent: the GPCI, which measures geographic variation in input prices, and the MEI, which measures inflation in input prices. The MEI cost shares have been recently revised using data from the 1989 SMS. The revised MEI and GPCI cost shares are similar to the current GPCI cost shares (Table ES-1). The shares for physician income are identical, the medical equipment share differes by only 0.1 percentage point, and the medical supplies share differs by only 0.2

TABLE ES-1

CURRENT (1992) AND REVISED (1996) GEOGRAPHIC PRACTICE COST INDEX COST SHARES

Category	Current Shares[1]	Revised Shares[2]
Physician net income	54.2	54.2
Non-physician employee compensation	15.7	16.3
Office expense	11.1	10.3
Malpractice insurance	5.6	4.8
Medical supplies	5.0	5.2
Medical equipment	2.4	2.3
Other	6.0	6.9
TOTAL	100.0	100.0

[1]Based on 1987 American Medical Association (AMA) Socioeconomic Monitoring System (SMS) data as published in Socioeconomic Characteristics of Medical Practice.

[2]Medicare Economic index cost shares derived from 1989 AMA data (Federal Register, November 25, 1992).

percentage points. The major differences are higher revised shares for nonphysician employee wages and other (miscellaneous) expenses, and lower revised shares for office rental and malpractice insurance. Because of the higher share of nonphysician expenditures, the labor share of the GPCI (physician plus nonphysician labor) rises to 70.5 percent from 69.9 percent. The national market share of the GPCI (inputs for which no geographic price variation is measured -- medical supplies, equipment, and other) rises to 14.4 percent from 13.4 percent because of the gain in the "other" category. The lower shares of the inputs with the most geographic price variation -- malpractice insurance and office rental -- and the higher share of the national market inputs that have no geographic price variation will tend to reduce the geographic variability of the revised (1996) GPCI as compared to the current (1992) GPCI.

The cost shares have two roles in the GPCI. First, they are used as weights for combining the three GPCIs -- work, practice expense, and malpractice -- into the overall Geographic Adjustment Factor (GAF). The GAF is never actually used for determining physician payments; it is only used for illustrative purposes. The top panel of Table ES-2 shows the 1992 GAF cost shares and the revised 1996 shares, which are derived from the revised MEI shares in Table ES-1. The physician work share is the same in both years, 54.2 percent. The malpractice share decreases from 5.6 to 4.8 percent, while the practice expense cost share rises from 40.2 to 41.0 percent.

The second use of the cost shares is in constructing the practice expense GPCI from the employee wage index, the office rental index, and supplies, equipment and miscellaneous. Changes in the weights of these components within the practice expense GPCI affect the GPCI and thus Medicare Fee Schedule physician payments. The bottom panel of Table ES-2 presents the shares of the practice expense components in the practice expense GPCI. For example, the office rental index weight in the GAF decreases from 11.1 to 10.3 percent with the update of the shares. This corresponds to a decrease from 27.6 to 25.1 percent weighting in the practice expense GPCI. This decrease was accompanied by increases in the weights for non-physician employee compensation and medical supplies, equipment and miscellaneous costs.

TABLE ES-2

CURRENT (1992) and REVISED (1996) COST SHARES FOR THE GAF AND THE PRACTICE EXPENSE GPCI

I. Cost Shares for the GAF	1992 GAF Share	1996 GAF Share
Work	54.2	54.2
Practice Expense	40.2	41.0
Malpractice	5.6	4.8
Total	100.0	100.0

II. Cost Shares for the Practice Expense GPCI	1992 Practice Expense GPCI Share	1996 Practice Expense GPCI Share
Non-Physician Employee Compensation	39.1	39.8
Office Rental	27.6	25.1
Medical Supplies, Equipment and Miscellaneous	33.3	35.1
Total	100.0	100.0

1.0 INTRODUCTION

1.1 Background on GPCI Cost Shares

The Geographic Practice Cost Index (GPCI) is used in adjusting Medicare Fee Schedule payments for regional variations in physicians' cost of practice. The GPCI is an input price index that measures the relative cost of a standard market basket of physician practice inputs across areas. The Laspeyres index number form chosen for the GPCI requires two basic components: national shares of each practice input in total practice costs and relative price terms for each area. The practice expense shares, which include physician net income as the "cost" of physician time, are often referred to simply as "cost shares." GPCI index values for each area are calculated by weighting the relative price terms by the national cost shares to form an average relative price for practice inputs in each area.

The current (1992) GPCI's cost shares were calculated using 1987 data from the American Medical Association's (AMA) Socioeconomic Monitoring System (SMS). The current cost shares are shown in Table 1-1. Mean physician net income and practice overhead expenses for self-employed physicians, as published in the AMA's Socioeconomic Characteristics of Medical Practice, were utilized. Six overhead cost components were distinguished: nonphysician employee compensation, office rental, malpractice insurance premiums, medical equipment, medical supplies, and miscellaneous. In the current GPCI, the latter three practice inputs are assumed to exhibit no geographic price variation. Sometimes it is convenient to sum them into a single "national market" cost share.

As part of the development of the GPCI, Zuckerman, Welch, and Pope (1987) and Welch, Zuckerman, and Pope (1989) considered several cost share issues. They compared cost shares computed from the AMA SMS data and HCFA's 1983 Physicians' Practice Cost and Income Survey (PPCIS) and concluded that they were similar. However, the AMA shares were preferred because they are available annually and are easily calculated from published data. Also, specialty-specific shares were calculated using the PPCIS data and specialty-specific GPCIs were simulated. Few differences of the specialty-specific GPCIs from the all-specialty GPCI were found. Zuckerman, Welch, and Pope (1987) concluded that a single set of all-specialty cost shares were sufficient for the GPCI.

TABLE 1-1

CURRENT (1992) GPCI COST SHARES

Category	Share
Physician net income	54.2
Non-physician employee compensation	15.7
Office rental	11.1
Malpractice insurance	5.6
Medical supplies	5.0
Medical equipment	2.4
Other	6.0

SOURCE: Welch, Zuckerman, and Pope (1989), Table III-1.

1.2 Overview of the Report

In this report, we conduct a reappraisal of the GPCI cost shares, as well as update them with more recent practice expense data. Important cost share issues are:

1. What sources of data on physician practice expenses, incomes, and gross revenues are available to calculate cost shares?

2. What are the strengths and weaknesses of the various data sources? What cost components are measured by each data source?

3. How similar are cost shares calculated from different sources? What explains observed differences among cost shares?

4. How stable are cost shares computed from different sources over time?

5. How sensitive are cost shares to different methods of calculation and data edits? How much are the GPCI values affected by any differences?

6. How different are cost shares for subgroups of physicians, such as specialties, geographic regions, or group sizes? How much are the GPCI values affected by these cost share differences?

7. How should the GPCI cost shares be updated now and in the future?

We examine these cost share issues in this report. Chapter 2 evaluates alternative sources of physician practice cost and income data that can be used to compute cost shares. Both overall survey/sample design and the specifics of the practice cost questions are considered. Shares calculated from alternative sources are compared and their stability over time is examined. Chapter 3 discusses our recommendation that cost shares used for construction of the Medicare Economic Index (MEI) be used for the GPCI as well. We also included two appendices in the report. Appendix A summarizes evidence on the sensitivity of cost shares to alternative methods of calculation and data preparation. Also, cost shares for subgroups of physicians are contrasted and the effects of different shares on GPCI values are analyzed. Appendix B considers alternatives for updating GPCI cost shares, for both the current GPCI revision and future revisions.

2.0 EVALUATION OF COST SHARE DATA SOURCES

This chapter describes and evaluates physician practice cost data of potential use in updating, refining, and validating the practice cost shares of the GPCI. Currently, the GPCI cost shares are based on 1987 data from the American Medical Association's (AMA) Socioeconomic Monitoring System (SMS). The SMS was chosen because of its frequency and availability (it is published annually). Also, the SMS is regarded in the survey research field as a reliable survey. However, given the important role of the GPCI in Medicare's new resource-based fee schedule, it is important to describe and evaluate all of the available sources of physician practice cost data.

For physician practice cost data to be of use in evaluating the current GPCI cost shares, a minimum of three requirements must be met. First, the data must be accurate, reliable, and defensible. Second, because the GPCI is national in scope, cost shares must be representative of the national population of patient-care physicians. Third, cost shares must be able to be disaggregated into categories of expenses that vary geographically. At a minimum, practice expenses should be able to be disaggregated to four categories that vary geographically: physician income, non-physician wages, office expenses, and malpractice insurance expenses.

This chapter will begin by identifying sources of physician practice cost data that satisfy the requirements described above. A wide variety of sources will be considered. After identifying potentially useful sources, we will describe each source in detail. Each source will be compared first according to sample design and then according to questionnaire content. Cost share questions from each survey will be examined in detail. Finally, the pros and cons of each source will be summarized, emphasizing such attributes as availability, reliability, consistency, and representativeness.

2.1 Overview of Data Sources

Although only a handful of sources of physician practice expense data are widely referenced in research, many other lesser known sources that may be of use in verifying and updating the GPCI exist. Schneider, *et al* (1992) identified 30 practice cost data sources from

three types of sponsors: federal government, medical societies, and management consultants. Each of the sources identified provided at least one component of practice costs or revenues.

Federal government sources include Bureau of the Census surveys (e.g., Assets and Expenditures Survey, Current Population Survey, Decennial Census, and Service Annual Survey), Internal Revenue Service special studies, HCFA surveys, and Bureau of Labor Statistics Employment and Earnings reports. With the exception of the HCFA Physicians' Practice Costs and Income Survey (PPCIS) and the Physician Payment Review Commission's (PPRC) Survey of Physicians (SOP), federal sources of data have either too small a sample size or too few practice cost components to be of use for the GPCI.

Several medical societies collect practice cost data, ranging from the American Medical Association (AMA) to smaller specialty-specific societies, such as the American Association of Family Practitioners. Among data collected by professional medical societies, the AMA's SMS is the only source that collects national practice cost data from all specialties for multiple expense components.

Another source of practice cost data is management consultants. Examples of management consultant are the Medical Group Management Association (MGMA), Mercer Inc., Ernest and Young, and Medical Economics magazine. These organizations provide business-related information to physicians, groups of physicians, and other providers to assist them in the operations of their medical practices. The information they provide ranges from practice management guidelines to results of national surveys that enable providers to compare their practice expense and compensation with other similar groups nationwide. The MGMA collects detailed group-practice expense data through an annual survey of its membership (entitled the Cost and Production Survey, or CAPS). Medical Economics magazine collects physician practice expense data from a survey of its listings (entitled the Continuing Survey of Physicians, or CSP). Among data collected by management consultants, the MGMA and Medical Economics surveys are the only sources that collect data across multiple practice expense categories.

In summary, of the practice cost data sources available, only five appear to be of use in refining, updating, and validating the GPCI, having satisfied the minimum requirements described earlier. The sources are: (1) the AMA's SMS; (2) HCFA's PPCIS; (3) PPRC's SOP; (4) Medical Economics' CSP; and (5) the MGMA's CAPS. The following sections will discuss

each of these sources in general, followed by more detailed sections discussing sample design and questionnaire content for each of the sources.

2.1.1 American Medical Association's Socioeconomic Monitoring System

The AMA's Socioeconomic Monitoring System (SMS) is a national survey of physicians, collecting data pertaining to practice characteristics, productivity, expenses, income, fees, and practice patterns (Gonzalez, 1992). The survey has been conducted annually since 1981. Before then the Periodic Survey of Physicians (PSP) collected similar data. SMS surveys from 1982 to the present are intertemporally comparable across expense and income variables.

The AMA's Physician Masterfile is used as the sample frame. A nationally representative sample is randomly selected from the Masterfile. Sample sizes within each specialty/region cell are verified to ensure that cells are proportional to the physician population. Previously, the SMS was described by the AMA as a "stratified random sample" (see Socioeconomc Characteristics of Medical Practice, 1989). In a more recent publication (see Socioeconomc Characteristics of Medical Practice, 1992), the description of the sample changed to simply a "random sample." Personal communication with the AMA's Sara Thran (June 1992) clarified that the sampling is not (and never has been) stratified. However the distributions within specialty and region are checked against Masterfile distributions to ensure national representation.

To be eligible for the survey, physicians had to meet the following criteria:

1. Currently provide patient care for 20 or more hours per week.
2. Cannot be a resident.
3. Must be nonfederal.
4. Cannot be a Doctor of Osteopathy.

The final number of completed cases for the most recent survey (1991 Core Survey) was 4,057, achieving an overall response rate of 66.7 percent (Table 2-1). Sample weights adjust for unit non-response and eligibility. That is, weights correct for differential non-response between groups of physicians (e.g., by specialty). Weights also correct for differential non-response by eligibility criteria (Gonzalez, 1992).

TABLE 2-1

SUMMARY OF PHYSICIAN DATA SOURCE CHARACTERISTICS

	SMS	PPCIS	PPRC	Medical Economics	MGMA
Sample Frame					
AMA Masterfile	●	●	●		
Membership Listings				●	●
Eligibility					
Patient care > 20 hours/week	●	●	●		
Not a resident, Clinical fellow, or Research Fellow	●	●	●		
Not employed by other than physician or group of physicians		●			
Other restrictions	●	●	●	●	●
Response Rate[a]	66.7%	61.0%	62.4%	31.5%	20.9%
Sample Size[a]	4,057	3,505	2,828	5,733	940
Survey Mode					
Mail				●	
Telephone					
Mail and Telephone		●	●		●
Frequency					
Annual since...	1982			1965	1986
Periodic		●			
No regularity			●		
Level of Expense Data					
Individual physician				●	
Group					●
Individual or Group	●	●	●		

[a]Pertains to most recent edition of data source.

SOURCES: AMA, 1989; HCFA, 1990; PPRC, 1988; Medical Economics, 1989; and MGMA, 1991.

The SMS is divided into eight sections: employment, practice characteristics, productivity, fees for selected visits, hospital utilization, income and expenses, professional ability, and referrals (Gonzalez, 1992). Refer to the AMA's Socioeconomic Characteristics of Medical Practice, 1992 for a summary of the detailed questionnaire. Physician income and six practice expense categories are collected: non-physician wages, office expenses, medical materials and supplies, malpractice, and medical equipment rental/depreciation, and other expenses (which includes miscellaneous expenses such as legal fees, automobile, continuing education, and outside lab fees). The questionnaire is designed to collect physicians' own share of practice expenses rather than the total for the whole practice. Also, physicians indicating they were not self-employed were skipped from the practice expense questions.[1]

2.1.2 Health Care Financing Administration's 1988 Physicians' Practice Costs and Income Survey

HCFA has undertaken several national surveys of physicians dating back to the mid-1970s. The 1988 PPCIS, the most recent of the PPCIS surveys, is part of a continuing effort to collect data pertaining the physicians' practice patterns, productivity, practice costs, incomes, and Medicare participation . The American Medical Association's Physician Masterfile, a comprehensive file of all physicians practicing in the U.S., was used as the sampling frame. A nationally-representative sample, stratified by specialty, Census Division and urban/rural location, was randomly selected from the Masterfile. Physicians from rural areas were oversampled, as were gastroenterologists, orthopedic surgeons, cardiologists, urologists, cardiothoracic surgeons, and "other" surgical specialists. General and family practitioners, internists, and other medical specialists were undersampled.

To be eligible for the survey, physicians had to meet the following criteria:

1. Currently provide patient care services for at least 20 hours per week (additionally, physicians must have spent at least 20 hours per week in patient care during 1988);

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[1] All physicians were asked to report their net income from medical practice, therefore in order to create truly accurate cost shares, employed physicians should be excluded from the calculation of mean net income.

2. Not currently a resident, clinical fellow or research fellow;

3. Not employed by a faculty practice plan, hospital, clinic or HMO, or by a federal government agency in 1988;

4. If in a multipractice arrangement, greater than 80 percent of income must be from the practice in which the physician was full or part owner, or employed by another physician or group of physicians; and

5. Have been in the same private practice for all of 1988.

The final number of completed cases (1988 Survey) was 3,505, achieving an overall response rate of 61 percent (Table 2-1). Of the total sample screened, 36 percent, or 3,015 physicians were ineligible to participate and were thus excluded from the survey. Most of these physicians were ineligible because of their employment arrangement. Sample weights adjust for (1) over- and under-sampling of selected groups of physicians; and (2) differential nonresponse rates between subgroups. These weights enable projections to the national population of physicians.

The 1988 PPCIS is divided into eleven sections: employment, productivity, practice size, practice costs, practice revenue, net income, malpractice medicare demographics, and an equipment supplement. For a complete discussion of survey methodology and components, refer to Dayhoff *et al* (1992). All of the practice expense components included in the SMS are also included in the PPCIS, plus some additional categories such as automobile expenses and continuing education expenses (Table 2-2). Unlike the SMS, the PPCIS collected practice-wide expense data. To enable comparisons with other data sources, practice expense indicators are divided by the number of full-time equivalent physicians associated with the practice. Like the SMS, expense questions are asked only of self-employed physicians whereas net income is asked of all physicians. Additionally, the PPCIS collects gross revenue, though the data collected for this indicator are not reliable.

The survey was conducted by the National Opinion Research Center (NORC), a social science research center affiliated with the University of Chicago. The questionnaire was administered using three modes. A little more than half (1,769) of the interviews were completed on hard-copy survey instruments. Another 1,726 interviews were conducted using computer-assisted telephone interviewing (CATI) in which data are entered directly into the computer system. The average telephone interview lasted about 45 minutes. Finally,

TABLE 2-2

SUMMARY MATRIX OF PRACTICE EXPENSE COMPONENTS

Practice Expense Component	SMS	PPCIS	PPRC	Medical Economics	MGMA
Physician Income/Wages	●	●		●	●
Deferred compensation		●			●
Fringe benefits		●			●
Non-Physician Income/Wages	●	●	●	●	● [1]
Deferred compensation		●	●		● [1]
Fringe benefits		●	●		● [1]
Office Rental/Depreciation	●	●	●	●	●
Utilities		●			●
Housekeeping					●
Purchased Services					●
Medical Supplies	●	●	●	●	●
Drugs and medications					●
General medical supplies					●
Laundry and linens					●
Malpractice Premiums	●	●	●	●	●
Medical Equipment Rental/Depreciation	●	●	●	●	●
Other Expenses	●	●	●	●	●
Automobile		●		● [2]	
Continuing education		●		● [2]	
Interest expense					● [1]
Administrative supplies			●	● [2]	
Marketing					●
Outside professional fees				● [2]	
Information services					● [1]
Physician consultations					● [1]
Contracted services			●		● [1]
Dues and subscriptions				● [2]	●
Other					●

[1]Contains further disaggregations.
[2]Discontinued in later years.

NOTE: Pertains to most recent edition of data source unless otherwise noted.
SOURCE: AMA, 1989; HCFA, 1990; PPRC, 1988; Medical Economics, 1989; and MGMA, 1991.

abbreviated mail questionnaires were completed by 10 respondents. The survey was fielded during an eight month period beginning July 1989 and ending March 1990.

Intertemporal comparisons are possible between several of the PPCIS survey years. The most reliable comparisons are those made between the 1978, 1983, and 1988 surveys (Dayhoff *et al*, 1992). In addition to having similar eligibility requirements and cost questions the five-year intervals between surveys provide a ten-year time horizon including a middle point. The most important differences between the years are that the 1978 PPCIS restricted the sample to 18 specialties (the other years made no exclusions based on specialty) and also limited the sample to physicians practicing in groups of less than ten full-time physicians. As for the future of the PPCIS, it is not known whether the survey will be continued.

2.1.3 Physician Payment Review Commission's Survey of Physicians

The PPRC conducted one survey in 1988 that collected much of the same information as the SMS and PPCIS surveys. The Survey of Physicians (SOP) was national in scope and collected detailed information for several practice expense components. The principal difference between the SOP and the other large national physician surveys is that several "non-Medicare" specialties were excluded (e.g., pediatrics, plastic surgery, and child psychiatry). In total, fourteen different types of specialties were excluded from the SOP. Another important difference is that the SOP excluded physicians who were not full or part owners of their practices (the SMS included all employees and the PPCIS included employees of other physicians or groups of physicians). Otherwise, the eligibility requirements are comparable to the other large national surveys.

Like the other surveys the SOP was drawn from the AMA's Masterfile. The sample was drawn randomly, stratified by fourteen specialty categories and three urbanicity categories. The survey was administered through the mail to a total of 6,930 physicians, resulting in a final sample size of 2,828 and achieving an overall response rate of 62.4 percent; similar to the 1988 PPCIS response rate of 60 percent (Table 2-1). The practice cost components included in the SOP are very similar to those of the SMS and PPCIS, however, the physician net income is <u>not</u> collected (Table 2-2). Similar to the PPCIS, practices expenses were asked for on a practice-wide basis, rather than physicians' own share. Similar to the

PPCIS, practice-wide expenses are divided by the number of full-time equivalent physicians associated with the practice in order to create indicators comparable to other sources. Gross revenues were not asked, making it difficult to approximate the physician wage component of practice expenses.

2.1.4 Medical Economics Continuing Survey of Physicians

Each year since the mid 1960s, Medical Economics magazine has conducted the Continuing Survey of Physicians (CSP). For the most recent survey (1991 data), questionnaires were mailed to 41,053 MDs and DOs in private office-based practice. The sample frame was the AMA Physician Masterfile. The sample was drawn to ensure adequate sample sizes in specialty/region/age cells, requiring the oversampling of some cells. The 1991 survey had a working sample of 6,690 cases, achieving an overall response rate of 25 percent (Table 2-1).

To be eligible for the survey, physicians had to be in office-based private practice. Physicians also must have been in the same practice for the entire survey year (e.g., all of calendar year 1991). There were no explicitly employment or activity (e.g., full vs. part time) requirements; however, if physicians explicitly indicated they were part-time they were excluded (Table 2-1).

Questionnaire content is considered proprietary material to Medical Economics. Therefore, it is not possible to identify all of the components asked for in the CSP. However, relying exclusively on published material, which typically appears in Fall issues of the magazine, the components appear very similar in definition to the categories provided on the other large national surveys discussed above (Table 2-2). Still, in the absence of a questionnaire it is not possible to examine and compare question wording.

2.1.5 Medical Group Management Association's Cost and Production Survey

The Medical Group Management Association (MGMA) is a management consulting company, providing baseline group practice expense data to it membership. Each year, since 1980, the MGMA has conducted the Cost and Production Survey (CAPS). Questionnaires are

sent to all of the MGMA members; in this sense it is more of a membership "census" than a survey. MGMA membership consists of group practices only, a group defined as being three or more full-time equivalent physicians formally organized to provide medical care. Some 4,700 groups are sent questionnaire. However only 1,000 responded in the 1990 CAPS (the 1990 survey is the most recent survey where published results are available), achieving an overall response rate of 21 percent (Table 2-1).

Of all the potential sources considered in this chapter, the CAPS collects the most detailed information. Practice costs are disaggregated to over 30 different categories, ranging from physician wages to real estate interest (Table 2-2).

2.2 Sample Design Comparability Between Data Sources

There are two areas of primary concern when assessing the comparability of the data sources described above. First, are the samples comparable? That is, are there significant differences in sample design or eligibility requirements that cause the various samples to be different? Second, are there differences in the wording of questions that cause the surveys to collect different types of information? It is evident from the preceding discussion that available physician surveys described above differ across several sample characteristics (refer back to Table 2-1).

There are many similarities in sampling procedures of the SMS and PPCIS. Data collection procedures were similar for the two surveys -- each relied predominantly on telephone interviewing with a mail questionnaire available for hard-to-reach or very busy physicians. The PPCIS has 10 (less than one percent) mail questionnaires completed and the SMS had 224 (5.5 percent). The PPCIS telephone interview was preceded by a mailing that included a practice expense worksheet. The goal of the worksheet was to enable physicians to reduce the amount of time taken during the phone interview. While nearly the entire SMS was conducted using Computer Assisted Telephone Interviewing (CATI) (only 4.6 percent of cases were completed on hard copy), the PPCIS completed just over half of its interviews using hardcopy questionnaires.

Both surveys used the same sampling frame, however, they project to different national populations of physicians. The PPCIS projected to a physician population of

217,970. The SMS, after controlling for differences in eligibility (by employment state only) is based on a population of 300,500 physicians. Finally, unit non-response rates were different for the two surveys. The unit nonresponse rate for the 1988 PPCIS was 61 percent and the 1990 SMS rate was 67 percent.

The PPCIS is more restrictive in its eligibility criteria (Table 2-1). The PPCIS requires that physicians be full or part owners of their main practice in 1988, or have been employed by another physician or group of physicians. The SMS does not have any requirements regarding employment status, with the exception of the exclusion of employees of the Federal government.

The PPCIS also requires that physicians in multi-practice arrangements derive at least 80 percent of their income from the practice in which the physician is a full or part-owner, or employee. However, so few physicians (n=5, or 0.1 percent of all physicians screened) were deemed ineligible because of this restriction that is not likely to cause significantly differences in the samples.

Both surveys required that participants currently provide patient care (or services) for at least twenty hours per week. The PPCIS included an additional requirement that physicians had to have provided patient care for at least twenty hours per week during 1988. The PPCIS excluded 27 physicians based on this requirement -- 0.3 percent of all physicians screened. Again, given the small number of cases excluded from the PPCIS as a result of this restriction, it is unlikely to account for large differences. Additionally, the PPCIS excluded physicians who were not in the same private practice for all of 1988. A total of 254 (3 percent) of all screened physicians were excluded on the basis of this requirement.

The principal difference in sampling methods is that the PPCIS was a stratified random sample (stratified by specialty, region, and urbanicity), with over- and under-sampling to provide adequate cell sizes for each stratum, while the SMS was a simple random sample with post-stratification weighting.

The SMS weighting methodology differs from that of the PPCIS. SMS weights account for unit non-response (ratio of target population to sample population) and eligibility (ratio of target eligibility to sample eligibility). The weights sum to the number of observations (i.e., relative weights).

In contrast, the PPCIS weights have three dimensions. First, like the SMS, PPCIS weights adjust for differential unit non-response. Second, since the PPCIS was a stratified random sample with over- and under-sampling of certain specialties and levels of urbanicity, sampling weights correct for the disproportionate probability of selection. Finally, unlike the SMS weights, the PPCIS weights enable direct projections to the national population of physicians (the "target" population).[2]

Of the remaining data sources, the PPRC's SOP is the most similar to the SMS and PPCIS in that it is also a national survey based on a random sample of Masterfile physicians. However, the SOP has two sampling differences that make it quite different from the other national surveys. First, the SOP is not representative of employed physicians -- including physicians employed by another physician -- because only self-employed physicians were included in the sample. This is an important distinction; 12 percent of all physicians on the PPCIS were employed by another physician. Second, the SOP is not representative of 14 different specialties, among them such specialties as dermatology, pediatrics, plastic surgery, psychiatry, and critical care medicine.

While employment and specialty exclusions are important characteristics of the SOP, they are not necessarily the most important with regard to the GPCI. Since cost shares are only calculated for self-employed physicians, it is not necessary that a data source represent employed physicians. Also, the SOP excluded what were believed to be specialties that did not treat significant proportions of Medicare patients. While the exclusion of specialties such as dermatology and psychiatry are debatable, it is probably not necessary to include pediatricians in the calculation of GPCI cost shares. The important shortfalls of the SOP are that physician net income (or practice revenues) are not asked (see Table 2-2), and that the survey was not intended to be ongoing.

It is difficult to determine the exact sampling methodology used by Medical Economics' CSP. Documentation is limited to one paragraph provided with the annually published survey results. Survey eligibility is not clear, particularly with regard to activity status (full versus part-time) and employment status. From the published material and calls to the office of Medical Economics, the only conclusion is that the sample is likely to be

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[2]SMS weights sum to the number of observations, whereas PPCIS weights sum to the sample's target population of physicians.

representative of full-time physicians, either self-employed or employed in an arrangement that enables them to qualify as "office-based" (recall that the CSP only requires that physicians be in "private, office-based" practice). Again, there is no means of confirming this nor is there any means of determining the types of employment arrangements included in the sample.

The MGMA's CAPS is the most different of all the data sources. The CAPS does not employ "sampling" techniques; rather, the entire list of MGMA members are sent survey forms. Of the MGMA members sent questionnaires, only 21 percent responded. This method of surveying creates a serious bias. First, there is a selection bias toward groups that are members of the MGMA. It is likely that groups that elect to become MGMA members are larger -- such groups can gain the most from belonging to a management association. A second level of selection bias is introduced in the response to the questionnaires. The 21 percent of groups deciding to participate in the survey were more likely to have had accounting infrastructures (in-house) that were more adept at completing lengthy expense questionnaires (the CAPS questionnaire is more detailed than those of the SMS, PPCIS, or PPRC). Finally, the sampling unit is the medical group: solo-practice physicians are not represented. This is a significant exclusion. According to the 1989 SMS, 36 percent of the sample were solo practitioners, and solo physicians comprised 48 percent of the sample of the 1988 PPCIS (the difference between the SMS and PPCIS proportions is due to difference in eligibility by employment status).

In summary, before discussing questionnaire content comparability, there appear to be some immediate concerns that limit the usefulness of several of these data sources in updating and refining the GPCI. Clearly, one of the more basic requirements of the GPCI cost-share data is that is represent the physician population accurately. The PPRC's SOP does not represent certain specialties. Practice cost shares, particularly physician earnings and non-physician earnings, vary by specialty (see Chapter 3), therefore the deletion of certain specialties is likely to have some effect on the calculation of average cost shares. In addition, the SOP was done at one point in time, the data pertaining to calendar year 1987. With no guarantee that the survey will be repeated in future years, basing future GPCI cost shares on the SOP would mean using data that is over five years old. The SOP also lacks complete cost share data: physician net income was not asked nor were practice revenues.

The MGMA data is also of limited value because of the exclusion of solo practices and the inherent selection bias associated with the survey methods. Expenditures on non-physician labor have been shown to be higher for larger groups (Pope and Burge, 1991; Dayhoff *et al* 1991). The selection bias toward larger practices magnifies this limitation. The MGMA published data only refers to multi-specialty groups, further biasing the results toward larger practices.

2.3 Cost Share Comparability Between Data Sources

In addition to differences in sampling, important variation exists in questionnaire content between the two surveys. These differences are likely to cause variation in the types of information collected. For instance, the types of "probes" provided at the end of each question, which often provide examples to help the respondent think of a particular expense, vary between the surveys. Also, some of the questionnaires ask for detailed breakdowns of expenses whereas others may only ask for a handful of components. A reasonable hypothesis is that when asked separate questions about many "micro" cost categories, respondents will tend to either report more accurately or round up to the nearest hundred or thousand dollars. The end result is that the sum of the components is much greater than if only the broad category were asked.

A discussion of questionnaire content is not necessary for all five data sources outlined above. The PPRC's SOP and the MGMA's CAPS will not be discussed in great detail because of their substantial design limitations. Further, it is not possible to discuss in detail Medical Economics' CSP due to the unavailability of a survey questionnaire or even a listing of survey components. Therefore, this section will devote considerably more attention to the SMS and the PPCIS and less to the others. However, cost shares are calculated from each of the five sources.

Six practice cost share components are available from all five sources: non-physician payroll, office expenses, medical supplies expenses, medical equipment rental/depreciation, malpractice premiums, and "other" (residual) category (Table 2-2). Table 2-3 shows cost shares from the five sources described above. Shares of total practice expenses as well as shares of overhead practice expenses are shown.

TABLE 2-3

COMPARISONS OF MEAN PRACTICE COSTS AND COST SHARES: VARIOUS PRACTICE COST SOURCES

Source/Year	Physician Earnings	Non-Physician Earnings	Office/Rental Depreciation	Medical Supplies	Malpractice Premiums	Medical Equipment	Other	Total Expenses[1]	Overhead Expenses[2]
Socioeconomic Monitoring System, AMA, 1988 data									
Dollars	$160,000	$48,400	$34,000	$14,500	$15,900	$6,900	$21,100	$300,800	$140,800
Total Share	53.2 %	16.1 %	11.3 %	4.8 %	5.3 %	2.3 %	7.0 %	100.0 %	N.A.
Overhead Share	N.A.	34.4 %	24.1 %	10.3 %	11.3 %	4.9 %	15.0 %	N.A.	100.0 %
Physicians' Practice Costs and Income Survey, HCFA, 1988 data									
Dollars	$163,114	$52,111	$20,187	$11,457	$14,805	$4,955	$20,219	$286,848	$123,734
Total Share	56.9 %	18.2 %	7.0 %	4.0 %	5.2 %	1.7 %	7.0 %	100.0 %	N.A.
Overhead Share	N.A.	42.1 %	16.3 %	9.3 %	12.0 %	4.0 %	16.3 %	N.A.	100.0 %
Survey of Physicians, PPRC, 1987 data									
Dollars	N.A.	$40,230	$20,796	$8,029	$16,582	$2,778	$28,979	$117,394	$117,394
Total Share	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Overhead Share	N.A.	34.3 %	17.7 %	6.8 %	14.1 %	2.4 %	24.7 %	N.A.	100.0 %
Medical Economics Continuing Survey, Medical Economics, 1988 data[3]									
Dollars	$117,780	$37,440	$13,580	$5,720	$10,100	$3,700	$15,690	$204,010	$86,230
Total Share	57.7 %	18.4 %	6.7 %	2.8 %	5.0 %	1.8 %	7.7 %	100.0 %	N.A.
Overhead Share	N.A.	43.4 %	15.7 %	6.6 %	11.7 %	4.3 %	18.2 %	N.A.	100.0 %
Cost and Production Survey, MGMA, 1989 data[4]									
Dollars	$148,955	$92,417	$26,046	$14,215	$10,671	$6,641	$47,376	$346,321	$197,366
Total Share	43.0 %	26.7 %	7.5 %	4.1 %	3.1 %	1.9 %	13.7 %	100.0 %	N.A.
Overhead Share	N.A.	46.8 %	13.2 %	7.2 %	5.4 %	3.4 %	24.0 %	N.A.	100.0 %

SOURCES: AMA, 1989; HCFA, 1990; PPRC, 1988; Medical Economics, 1989; and MGMA, 1991.

NOTES:

[1]Imputed by summing mean (or median) expense components, including net income.

[2]Imputed by summing mean (or median), excluding net income.

[3]published material only reports medians.

[4]Multi-spoecialty groups only.

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The SMS and the PPCIS ask similar questions about net income from medical practice. Both questionnaires ask for "own net income from medical practice, after expenses but before taxes." Research comparing the 1988 PPCIS and 1989 SMS Core Survey showed no significant difference in mean net income between the surveys (Schneider *et al*, 1992). The cost shares for this indicator are similar also, 53.2 percent for the SMS compared to 56.9 percent for the PPCIS. A likely reason for the higher PPCIS share is that the PPCIS asks for wages of all physicians associated with the practice, whereas the SMS asks only for personal net income. The CSP physician earnings share appears somewhat higher than the others, however, it is not possible to examine the wording of the question. The CAPS share is lower than the others, most likely due to the larger shares for other components, particularly non-physician earnings, which reflects the CAPS bias toward larger, multispecialty practices.

There are several differences in the non-physician payroll expense variable between the sources. The least complicated is the SMS question, which simply asks for "total non-physician payroll expenses, including fringe benefits." There are no probes or examples provided with the SMS question. The PPCIS question asks for wages, deferred compensation, and fringe benefits separately -- probing for such expenses as profit sharing, 401-K plans, unemployment insurance, life and disability insurance, etc. The three components are summed together to arrive at total non-physician expenses. Again, the PPCIS share for non-physician earnings is slightly higher than the SMS share (18.2 and 16.1 percent, respectively) (Table 2-3). One possible explanation for this difference is that components asked for separately are more likely to sum to a greater amount than if asked for in one question, relying only on probes. The SOP's 34.3 percent share is surprising given that the question wording is very similar to that of the SMS and PPCIS. However, one possible explanation of the higher share is that the SOP question asks for wages of patient-care and non-patient-care employees separately. The CSP share is very similar to the PPCIS, and the CAPS share is relatively high, owing to the large-practice bias and the separate collection of wages and benefits (like the PPCIS).

The SMS and PPCIS office rental and depreciation shares differ substantially; 11.3 percent for the SMS compared to 7.0 percent for the PPCIS (Table 2-3). The SMS asks for the physician's own share of the mortgage/lease/rent, office/building depreciation, and utilities (including telephone expense). On the PPCIS, it is first determined whether the physician

rents, owns, rents and owns, or neither. Physicians are then routed to the appropriate question: owners are asked about depreciation/interest costs and renters are asked about rental/lease costs. Both are then asked about utility and telephone expenses. Physicians with no office expenses were asked to verify that they indeed had no expenses. There are three likely explanations for the differences. First the PPCIS routing of physicians based on whether they own, lease, or rent enables interviewers to ask for a more specific cost (i.e., rent or depreciation), which may serve as a better information probe. Second, the SMS asks for all office expenses in one question, as opposed to the PPCIS which asks for utilities separately. Third, the SMS probes with the work "mortgage," which is not probed for in the PPCIS. The CPS and the CAPS office rental and depreciation shares are very similar to that of the PPCIS.

The questions about expenses for medical materials and supplies are very similar across the sources. The cost shares do not differ dramatically, however the CSP share is close to half the shares for the other sources (Table 2-3). The SMS and PPCIS shares are very similar (4.8 and 4.0 percent, respectively), as is the wording of the questions except that the SMS adds the working "...and (expenses) for outside lab work and other services" (emphasis added) at the end of the medical supplies question. The probe for services may explain the slightly higher SMS share.

The SMS medical liability expense question asks physicians to report their share of medical malpractice insurance coverage premiums. The PPCIS question is similar, with a probe asking for both physician and non-physician expenses as well as amounts paid for both basic and excess coverage and contributions to state patient compensation funds. The SMS does not probe with any such detail. The shares for the SMS, PPCIS, CSP, and the CAPS are remarkably similar, ranging from 3.1 percent to 5.3 percent (Table 2-3).

The medical equipment shares were also very similar between surveys. Again, the PPRC's SOP had the highest share, 2.4 percent, while the other shares ranged from 1.7 percent (PPCIS) to 2.3 percent (SMS) (Table 2-3).

The "other" category aggregates the residual expenses not elsewhere classified. The "other" category for the SMS incudes "car upkeep, professional association memberships, professional journals" etc. The PPCIS "other" category includes all of the expense questions not classified elsewhere: automobile expenses, continuing education expenses, and

miscellaneous expenses. The SMS share was 7.0 percent compared with 7.1 percent for the PPCIS (Table 2-3). Both of these shares compare favorably to the CSP (7.7 percent). However, both the SOP and the CAPS have much larger shares. It is likely that the SOP share is larger because it is comprised of several components: non-medical supplies, contracted services, and physician employee wages, deferred compensation, and fringe benefits. Similarly, the CAPS "other" expense share is comprised of many categories (refer to Table 2-2).

One generic explanation for differences in practice expenses between the SMS and PPCIS is that per-physician shares are obtained differently in the two surveys. The PPCIS asks physicians to report expenses for the entire practice. To calculate per-physician shares, practice-level expenses are divided by the number of full-time equivalent physicians. In contrast, the SMS asks physicians to report (estimate) their own share of expenses. It is difficult to determine the effect of this methodological difference. In some cases, physicians may find it difficult to report practice level data, while in other cases physicians may not know their share of expenses.

There is one final note concerning cost share comparability. Item non-response rates are an important indicator of the accuracy of data collected; high item non-response rates raise concern about selection bias. Are certain types of physicians systematically not answering certain questions? If this is the case, then the means (and shares) calculated for such a question may not accurately reflect the population it is intended to represent. Ideally, it would be of interest to examine item non-response rates for each of the five sources. Unfortunately, item non-response rates are rarely published and are generally not discussed in commercially produced data documentation. However, Schneider, *et al*, 1992 calculated item non-response rates for the SMS and the PPCIS using publicly available Public Use Tapes. For practice expense questions, the 1989 SMS had non-response rates ranging from a low of 25 percent (medical liability expense to a high of 38 percent (medical equipment expense). In contrast, the PPCIS non-response rates for practice expense questions range from a low of less than 1 percent (office rental expense) to a high of 19 percent (non-physician deferred compensation). While this is important to note, it is difficult to draw any conclusions as to the possible effects this may have on reported cost shares.

2.4 Stability of Cost Shares Over Time

Another method of evaluating the difference sources of practice expense data is to examine the stability of cost shares calculated from the different sources over time. Random fluctuation from one year to the next may indicate the degree of sampling error associated with the indicators. On the other hand, consistent shares from one year to the next is a good indicator of reliability as well as a good indicator of the source's usefulness in future years. This section will compare time trends in cost shares for three of the surveys discussed above: SMS, CSP, and CAPS. The PPCIS and SOP were excluded from this section. The SOP was excluded for obvious reasons -- there is only one year to analyze. The PPCIS was excluded because shares from the earlier years are not published and would require calculation using multiple Public Use Tapes, which was thought to be beyond the scope of this project.

The AMA has indicated that SMS practice expense questions have not changed since 1982.[3] Additionally, the overall methodology has not changed significantly since 1982. Therefore, there is no reason to believe cost shares would fluctuate over time. In fact, SMS cost shares have remained very stable over time (Table 2-4). Physician earnings ranged from a high of 58.2 percent in 1982 to a low of 52.5 percent in 1986. The share of non-physician earnings increased from 1983 to 1988, but seems to have leveled since 1988. Office rental/depreciation peaked in 1985 but has been declining since. The malpractice share increased steadily until 1987, when it began to decline. The medical equipment and residual share vary somewhat from one year to the next but fail to show a trend.

Cost shares calculated for Medical Economics' CSP are also quite stable over time (Table 2-5). The office rent shares were lower than SMS shares in all three years, while physician and non-physician earnings shares were higher. Published 1990 date did not break out an "other" category separately, however, a share was reported. Using the partial total and the reported share, and "other" dollar value was calculated. The error introduced by this imputation helps explain the dramatic rise in the residual share. In the absence of questionnaires for all CSP years, it is difficult to explain changes in cost shares.

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[3]Personal communication with Sara Thran from the AMA, June 1992.

TABLE 2-4

MEAN PRACTICE COSTS AND COST SHARES, SMS SURVEYS, 1982-1990

Year of Data	Physician Earnings	Non-Physician Earnings	Office/Rental Depreciation	Medical Supplies	Malpractice Premiums	Medical Equipment	Other	Total Expenses
1990	$185,600	$54,400	$33,700	$16,500	$14,500	$7,700	$23,200	$335,600
	55.3 %	16.2 %	10.0 %	4.9 %	4.3 %	2.3 %	6.9 %	100.0 %
1989	$175,300	$52,700	$33,300	$17,000	$15,500	$7,600	$22,300	$323,700
	54.2 %	16.3 %	10.3 %	5.3 %	4.8 %	2.3 %	6.9 %	100.0 %
1988	$160,000	$48,400	$34,000	$14,500	$15,900	$6,900	$21,100	$300,800
	53.2 %	16.1 %	11.3 %	4.8 %	5.3 %	2.3 %	7.0 %	100.0 %
1987	$146,200	$42,500	$30,000	$13,500	$15,000	$6,500	$16,200	$269,900
	54.2 %	15.7 %	11.1 %	5.0 %	5.6 %	2.4 %	6.0 %	100.0 %
1986	$131,100	$38,800	$28,500	$13,200	$12,800	$7,000	$18,100	$249,500
	52.5 %	15.6 %	11.4 %	5.3 %	5.1 %	2.8 %	7.3 %	100.0 %
1985	$124,500	$35,600	$26,400	$11,200	$10,500	$5,900	$13,100	$227,200
	54.8 %	15.7 %	11.6 %	4.9 %	4.6 %	2.6 %	5.8 %	100.0 %
1984	$118,600	$31,200	$24,400	$10,700	$8,400	$5,500	$13,800	$212,600
	55.8 %	14.7 %	11.5 %	5.0 %	4.0 %	2.6 %	6.5 %	100.0 %
1983	$115,900	$29,000	$21,200	$9,300	$6,900	$5,100	$13,900	$201,300
	57.6 %	14.4 %	10.5 %	4.6 %	3.4 %	2.5 %	6.9 %	100.0 %
1982	$109,000	$30,100	$17,800	$7,600	$5,800	$5,100	$12,000	$187,400
	58.2 %	16.1 %	9.5 %	4.1 %	3.1 %	2.7 %	6.4 %	100.0 %

SOURCE: Socioeconomic Characteristics of Medical Practice, AMA, 1983-1991 eds.

TABLE 2-5

MEDIAN PRACTICE COSTS AND COST SHARES, MEDICAL ECONOMICS, 1988-1990

Year of Data	Physician Earnings	Non-Physician Earnings	Office/Rental Depreciation	Medical Supplies	Malpractice Premiums	Medical Equipment	Other[1]	Total Expenses
1990	$141,720	$43,030	$15,620	$8,300	$10,400	$5,420	$26,821 [2]	$251,311
	56.4 %	17.1 %	6.2 %	3.3 %	4.1 %	2.2 %	10.7 %	100.0 %
1989	$132,550	$41,770	$15,320	$5,850	$10,730	$3,980	$17,260	$227,460
	58.3 %	18.4 %	6.7 %	2.6 %	4.7 %	1.7 %	7.6 %	100.0 %
1988	$117,780	$37,440	$13,580	$5,720	$10,100	$3,700	$15,690	$204,010
	57.7 %	18.4 %	6.7 %	2.8 %	5.0 %	1.8 %	7.7 %	100.0 %

NOTES:

[1]Includes continuing education, business supplies, automobile, business equipment. non-medical consultants, dues and subscriptions.

[2]Imputed from reported cost share (median total practice expense times .113, the reported cost share for "other" expense.

SOURCE: Medical Economics, 1989, 1990 and 1991 eds.

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Cost shares form the MGMA's CAPS are different from the other sources, particularly shares for physician earnings, non-physician earnings, and residual costs (Table 2-6). However, CAPS cost shares are stable over time. In 1990, the share of non-physician earnings increased while the residual share decreased. Given the MGMA's survey methods, it is possible that fluctuations over time are due to changes in the mix of respondents.

2.5 Summary and Conclusions

Of the many sources of physician practice cost data that are available, only a few meet the minimum requirements necessary to update, refine, and validate the GPCI. The requirements are that (1) the data are accurate, reliable, and defensible; (2) cost-shares must be representative of the national population of patient care physicians; (3) data must be available on a periodic basis so that shares can be updated; and (4) cost shares must be able to be disaggregated into categories of expense that vary geographically. Specifically, physician income, non-physician wages, office expenses, and malpractice insurance expenses must be available. Another requirement is data availability and documentation -- many physician practice cost data sources are proprietary, particularly those developed by management consultants for use by clients. Imposing these requirements restricts the number of viable data sources significantly.

We have identified five sources that meet most of these requirements. They are: the AMA's SMS, HCFA's PPCIS, PPRC's SOP, Medical Economics' CSP, and the MGMA's CAPS. After a discussion of survey methodology and questionnaire components, it is clear that several of these sources do not meet all of the GPCI requirements.

The PPRC's SOP has four important limitations in updated and refining the GPCI. First, it lacks a physician income question or a practice revenue question, which may have been used to impute physician earning. Second, the SOP was done at one point in time, with no indication of whether it will be conducted again. Practice cost data on the SOP refer to calendar year 1987; that would mean basing a refined GPCI on data that is, at this writing, already five years old. Third, documentation for the survey is incomplete, and few people at PPRC or elsewhere are knowledgeable about the survey. Finally, the survey does not

TABLE 2-6

MEAN PRACTICE COSTS AND COST SHARES, MEDICAL GROUP MANAGEMENT ASSOCIATION (MGMA)*; 1984-1990

Year of Data	Physician Earnings	Non-Physician Earnings	Office/Rental Depreciation	Medical Supplies	Malpractice Premiums	Medical Equipment	Other	Total Expenses
1990	$149,583 41.1 %	$109,262 30.0 %	$26,046 7.2 %	$6,641 1.8 %	$14,215 3.9 %	$10,671 2.9 %	$47,376 13.0 %	$363,794 100.0 %
1989	$148,955 43.2 %	$92,417 26.8 %	$21,533 6.2 %	$5,293 1.5 %	$10,309 3.0 %	$12,509 3.6 %	$53,827 15.6 %	$344,843 100.0 %
1986	$117,345 41.7 %	$74,570 26.5 %	$22,723 8.1 %	$5,941 2.1 %	$9,226 3.3 %	$9,260 3.3 %	$42,522 15.1 %	$281,587 100.0 %
1985	$112,727 42.5 %	$69,972 26.4 %	$21,672 8.2 %	$4,516 1.7 %	$9,402 3.5 %	$7,457 2.8 %	$39,620 14.9 %	$265,366 100.0 %
1984	$113,530 43.6 %	$70,063 26.9 %	$20,191 7.8 %	$5,108 2.0 %	$8,587 3.3 %	$6,152 2.4 %	$36,695 14.1 %	$260,326 100.0 %

*Multispecialty groups only.

SOURCE: Cost and Production Survey Report, MGMA, 1987 and 1991 eds.

represent all specialties, although since it does represent major Medicare specialties this is not a major limitation.

Medical Economics' CSP also suffers from a lack of documentation. The sponsor of the survey has indicated on several occasions that survey materials are proprietary and unlikely to ever be made available to the public. In the absence of at least a questionnaire, CSP data are not suitable for the GPCI.

The MGMA's CAPS also has a very abbreviated methodology description. However, they do publish their entire questionnaire with each annual practice cost report. The CAPS' most significant limitation is its methodology, which biases the results toward larger multispecialty practices and entirely excludes solo-practice physicians.

HCFA's PPCIS is a viable option for refining, updating, and validating the GPCI, at least in terms of its sampling methods and questionnaire design. The only limitation of the PPCIS is that there is no guarantee that the survey will be conducted in the future. Given the new Medicare fee schedule, it is likely that HCFA will be interested in conducing another PPCIS. In the mean time, the most recent PPCIS cost shares are already four years old, which limits the PPCIS in it usefulness in updating the GPCI.

The AMA's SMS is the only national survey of physician that meets the four basic requirements described above. The survey methods are very similar to those of the PPCIS; that is, steps are taken to ensure that the sample is representative and that non-response is controlled for with sampling weights. All of the necessary cost components are collected on the questionnaire, and detailed documentation is available both in published material and by contacting the AMA. SMS cost shares are stable over time, reflecting the consistency with which the AMA has conducted the survey. One limitation of the SMS is that it is conducted by an organization representing physicians. Conflicts of interest do not appear to have influenced the SMS or access to data thus far. However, this may not necessarily be the case in the future. Overall, we conclude that the AMA's SMS data is the best choice to update the GPCI cost shares.

3.0 MEDICARE ECONOMIC INDEX COST SHARES

Given our conclusion that the AMA's Socioeconomic Monitoring System is the best source to update the GPCI cost shares, we must still determine a methodology for calculating the shares. One possibility is to use the data in the AMA's annual publication Socioeconomic Characteristics of Medical Practice, which provides mean values of physicians' earnings and practice expenses tabulated by the AMA from their annual survey. Cost shares can be calculated by dividing mean expenses for each category by mean total expenses (including physicians' earnings). This method effectively weights large practices more heavily than small practices (since the shares are calculated from mean costs, rather than calculating the shares for each practice and then averaging). A second possibility is to purchase the SMS data tapes from the AMA and calculate the cost shares based on individual practice costs. This method is relatively costly and time consuming, and seems unlikely to yield substantially different results than the published data, given our sensitivity analysis presented in Appendix A.

A third alternative is to base GPCI cost shares on shares calculated by HCFA's Office of the Actuary for the Medicare Economic Index (MEI). Promulgated in 1975, the MEI has been used to construct the annual market basket update for Medicare physician payments. The MEI measures increases in physician practice costs by inflation in input prices and general wage levels. Thus, the MEI is the intertemporal counterpart to the geographic GPCI index: the GPCI measures geographic variation in input prices, and the MEI measures inflation in input prices.

The MEI was recently revised (Federal Register, 1992) to reflect changes in physician practices in purchasing goods and services. The cost shares for the MEI previous to its latest revision were developed from a special study conducted in 1982. In updating the MEI, two major data sources were considered for estimating a set of cost shares: the AMA Socioeconomic Monitoring System and the Medical Economics survey of practice expenses and earnings. Because of the superior representativeness of the AMA sample and the availability of mean expenses and earnings (rather than medians), HCFA's Office of the Actuary chose to use the AMA data for developing the cost shares for the revised MEI (Freeland *et al*, 1991). The revised MEI cost shares were based on data from the 1989 SMS.

Table 3-1 presents the previous and the revised MEI cost shares. The largest decrease is in the physician's net income share, which diminished from 60.0 to 54.2 percent. The non-physician employee compensation share decreased by 2.5 percentage points while the "other" cost share rose by 2.5 percentage points. The office expense, malpractice and medical supplies shares all rose slightly. In addition, the revised MEI includes a new category for medical equipment.

Table 3-1 also presents the current (1992) GPCI cost shares. The physician work cost shares are identical, 54.2 for both the revised MEI and the current GPCI. The medical equipment shares differ by only 0.1 percentage points, and the medical supply shares differ by 0.2 percentage points. The non-physician employee compensation share is larger in the revised MEI, relative to the GPCI, while the office expense share and the malpractice share are smaller. The largest difference between shares is for miscellaneous, which is 0.9 percentage points higher in the revised MEI. The Health Care Financing Administration decided to adopt the revised MEI cost shares for the updated (1996) GPCI so that its two indexes of physician input prices -- the MEI and the GPCI would have consistent cost shares.

The cost shares have two roles in the GPCI. First, they are used as weights for combining the three GPCIs -- work, practice expense, and malpractice -- into the overall Geographic Adjustment Factor (GAF). The GAF is never actually used for determining physician payments; it is only used for illustrative purposes. The top panel of Table 3-2 shows the 1992 GAF cost shares and the revised 1996 shares, which are derived from the revised MEI shares in Table 3-1. The physician work share is the same in both years, 54.2 percent. The malpractice share decreases from 5.6 to 4.8 percent, while the practice expense cost share rises from 40.2 to 41.0 percent.

The second use of the cost shares is in constructing the practice expense GPCI from the employee wage index, the office rental index, and supplies, equipment and miscellaneous. Changes in the weights of these components within the practice expense GPCI affect the GPCI and thus Medicare Fee Schedule physician payments. The bottom panel of Table 3-2 presents the shares of the practice expense components in the practice expense GPCI. For example, the office rental index weight in the GAF decreases from 11.1 to 10.3 percent with the update of the shares. This corresponds to a decrease from 27.6 to 25.1 percent weighting in the practice expense GPCI. This decrease was accompanied by

TABLE 3-1

MEDICARE ECONOMIC INDEX COST SHARES

Category	MEI Previous Shares	MEI Revised Shares[1]	Current (1992) GPCI Shares
Physician net income	60.0	54.2	54.2
Non-physician employee compensation	18.8	16.3	15.7
Office expense	9.2	10.3	11.1
Malpractice insurance	4.0	4.8	5.6
Medical supplies	3.6	5.2	5.0
Medical equipment	NA	2.3	2.4
Other	4.4	6.9	6.0

[1]The revised MEI shares are also the updated (1996) GPCI cost shares.

NOTE: Medical equipment was not a category in the original MEI.

SOURCE: Federal Register Vol. 57, No. 228, November 25, 1992.

TABLE 3-2

CURRENT (1992) and REVISED (1996) COST SHARES FOR THE GAF AND THE PRACTICE EXPENSE GPCI

I. Cost Shares for the GAF	1992 GAF Share	1996 GAF Share
Work	54.2	54.2
Practice Expense	40.2	41.0
Malpractice	5.6	4.8
Total	100.0	100.0

II. Cost Shares for the Practice Expense GPCI	1992 Practice Expense GPCI Share	1996 Practice Expense GPCI Share
Non-Physician Employee Compensation	39.1	39.8
Office Rental	27.6	25.1
Medical Supplies, Equipment and Miscellaneous	33.3	35.1
Total	100.0	100.0

increases in the weights for non-physician employee compensation and medical supplies, equipment and miscellaneous costs.

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APPENDIX A

SENSITIVITY OF COST SHARES TO METHOD OF CALCULATION/ SAMPLE

1.1 Data Preparation Methods

Calculation of cost shares is not as straightforward as one might initially think; there are numerous methodological decisions that must be made to calculate the shares. Table A-1 shows the sensitivity of cost shares to different methods of calculation. The shares are relatively invariant to the method of calculation, rarely varying by more than a percentage point or two across the different sets of shares. The majority of these cost shares are calculated using 1988 PPCIS data, based on work done by Dayhoff, Cromwell, and Rosenbach (1993) and Dayhoff, Cromwell, Rosenbach and Ammering (1991). However, we anticipate that, given the similarities between the PPCIS and the SMS, analysis performed with the SMS data would yield very similar results.

The remainder of this section discusses the methodological issues behind the different sets of cost shares presented in Table A-1. To simplify the presentation, all cost categories that are assumed to be based on a national market (and not vary in price geographically) are included in the "other" category on this table.

1.1.1 Weighting of Data

Physician surveys such as the PPCIS and the SMS generally provide sampling weights to adjust for (1) over- and under-sampling of selected groups of physicians; and (2) differential nonresponse rates between subgroups. Thus, weighted values provide national projections for eligible physicians who fall into a certain classification.

It is also possible to weight cost shares by the size of the physicians' practices. The desirability of using these weights is a more difficult conceptual issue than the use of sample weights. If the cost shares are intended to represent the costs of the "average" physician, then observations would not be weighted by practice size. If the cost shares are intended to represent the costs of the "average" patient visit, then the observations would be weighted by the number of patient visits. Alternatively, if the cost shares are to represent the average service provided, then weighting by gross practice revenue is appropriate. On both the SMS and PPCIS, gross revenue can be constructed as the sum of all practice expense, including

TABLE A-1

1988 COST SHARES CALCULATED USING DIFFERENT METHODOLOGIES

	Physician Earnings	Non-physician Employee Earnings	Office Space Costs	Malpractice Costs	Other Costs
1. SMS unweighted	55.7 %	14.7 %	11.6 %	5.6 %	12.4 %
2. SMS weighted	53.2	16.1	11.3	5.3	14.1
3. PPCIS unweighted - based on sample with imputed data	56.7	17.3	7.6	5.5	12.9
4. PPCIS weighted - based on sample with imputed data	56.9	18.2	7.0	5.1	12.8
5. PPCIS weighted - based on sample with minimal data cleaning and imputed data	55.6	18.3	6.9	5.2	14.0
6. PPCIS weighted - based on sample with minimal data cleaning, no imputations, combined values excluded	54.5	18.5	7.2	5.4	14.5
7. PPCIS weighted - based on sample with minimal data cleaning, no imputations, combined values included	55.1	18.4	7.0	5.2	14.3
8. PPCIS weighted - based on sample of respondents who answered all questions	56.6	17.3	7.0	4.8	14.3

SOURCE: Socioeconomic Characteristics of Medical Practice 1990/1991; Dayhoff, Cromwell, Rosenbach, and Ammering 1991; Dayhoff, Cromwell, and Rosenbach, 1993.

earnings by the physician.

Weighted and unweighted cost shares from the 1988 PPCIS and 1988 SMS are presented as the first four rows in Table A-1. PPCIS shares are calculated from Dayhoff, Cromwell, and Rosenbach (1993). Weighted SMS shares are calculated from published AMA data, while unweighted SMS shares are found in Gillis and Willke (1991). PPCIS weighted shares never differ from their unweighted counterparts by more than one percentage point. The SMS shows the physicians' share being slightly lower when the data are weighted, with the non-physician employee earnings and other shares being higher to offset this difference. However, these differences between weighted and unweighted cost shares are still quite small.

1.1.2. Treatment of Outlier Values

Discussions with Sara Thran of the AMA indicate that little cleaning of data in the SMS is performed. The AMA routinely examines all values that exceed five standard deviations from the mean. Of these outliers, Ms. Thran indicated that approximately six values per survey would be recoded as missing. To test the sensitivity of cost shares to this methodology, Dayhoff, Cromwell, Rosenbach, and Ammering (1991) examined all costs per self-employed physician more than five standard deviations from the mean using the 1988 PPCIS. They then selected the seven least believable outliers, and recoded these variables as missing. Cost shares were calculated using this data set and a second data set which had undergone more rigorous review and replacement. These cost shares are shown in Table A-1 as the PPCIS weighted shares with imputed data and the PPCIS shares with minimal cleaning and the imputed data. The differences between the two sets of cost shares are quite small--generally varying by less than one percentage point. The share of the "other" category is 1.1 percentage points higher when minimal data cleaning occurs, probably reflecting extremely large amounts placed into the miscellaneous category on the PPCIS.

1.1.3 Treatment of Combined Values

Ms. Thran indicated that the SMS contains few combined values. These typically occur in a situation where the physician can only provide his total costs with no breakdown into the separate cost components. In these cases, the total value is entered into the survey and the cost components are entered as missing data. The PPCIS includes many more

combined values. This is in part a function of differences in the questionnaires–the PPCIS asks for a much more detailed breakdown of costs than does the SMS. However, given the few combined responses that the AMA identifies, we wonder if they may be overlooking combined values. For instance, office rental values could include medical equipment costs, resulting in a zero or missing value for equipment expenses.

To test the sensitivity of the cost shares to the presence of combined values, cost shares were calculated based on the PPCIS both excluding all combined values and including all combined values. Since some other value is combined into the category the cost share would be overstated for cases where the combined values are included in the calculations. Table A-1 indicates that overlooking combined values has little effect on the cost shares. The largest difference between cost shares including and excluding combined values is 0.6 percentage points for the physician earnings share.

1.1.4 Imputed Data

Both the PPCIS and the SMS suffer from some level of item nonresponse. This typically occurs when a physician is either unwilling or unable to provide the requested cost information. Several approaches can be used to calculate average costs and cost shares when missing data are present. One method is to calculate mean cost using all observations that responded to a particular question. These can be divided by mean gross revenue to calculate weighted cost shares. As a result, the number of observations upon which each average is based may vary considerably, and different subsets of physicians may be answering each question. This method is implicitly used when calculating SMS cost shares from published data. A second approach would be to calculate costs using only observations for which all necessary data were provided. The major drawback of this approach is that the number of observations in the sample may be reduced dramatically. For example, in the 1988 PPCIS roughly half the observations are lost if this requirement is imposed; many of the deleted observations are missing responses to only one or two questions. A third approach is to impute missing data based on physician and practice characteristics.

Rows 5, 6 and 8 of Table A-1 present cost shares for the 1988 PPCIS using all three techniques. Cost shares do not differ greatly using the different techniques; for example, the three physician cost shares vary by only 1.6 percentage points and the non-physician employee earnings share varies only by 1.1 percentage points. We expect that the SMS would yield similar results from this type of analysis.

1.2 Physician Subgroups

Dayhoff, Cromwell, and Rosenbach (1993) investigate whether physician practice cost shares vary enough across specialties or geographic locations to warrant utilizing separate cost shares for some groups of physicians. This analysis was conducted with the 1988 PPCIS data. However, given the overall similarities between the PPCIS and the SMS, the conclusions drawn from this analysis are likely to be the same that would be found if the analysis were conducted with the SMS.

1.2.1 Cost Shares Based on Physician Specialty

Table A-2 presents physician cost shares based on the PPCIS, first calculated for all physicians and then calculated for sixteen specialty groupings. Physicians responding to the PPCIS were asked questions about the earnings of physicians in their practices, non-physician employee earnings, office space costs, and malpractice cost. The "other costs" category is the sum of the medical equipment, medical supplies, automobile expenses, continuing education, and miscellaneous categories on the PPCIS.

All of the specialty-specific cost shares show noticeable variations from the cost shares calculated for all physicians. The physician earnings share ranges from a high of 73.1% for anesthesiology to a low of 47.8% for general/family practice, with a national mean of 56.7%. The non-physician employee earnings share has a mean value of 17.3%. The office cost share has a mean value of 7.6%. While no specialty has a share more than two percentage points greater than this, the shares for anesthesiology (1.5%), radiology (3.5%), and other specialties (4.1%) all have shares that are markedly lower than the national average.

The appropriate statistical technique to simultaneously test for differences in a set of cost shares is multivariate analysis of variance (MANOVA). MANOVA, rather than standard analysis of variance, should be used because the issue is not whether a particular share differs across groups, but whether there are any differences in the entire set of cost shares across groups. MANOVA appropriately accounts for the simultaneous nature of the statistical test. The pooled MANOVA F-statistic (Wilk's criterion) for all 16 specialties implied it was extremely unlikely (a less than one in ten-thousand chance) that all of the specialty shares came from the same underlying cost distribution.

To determine the effect these different cost shares have on the GPCI, Dayhoff, Cromwell, and Rosenbach recalculate the GPCI using alternative sets of specialty--specific

TABLE A-2

PHYSICIAN PRACTICE COST SHARES NATIONALLY AND BY SPECIALTY BASED ON THE 1988 PHYSICIANS' PRACTICE COSTS AND INCOME SURVEY

Specialty	N	Physician Earnings	Non-Physician Employee Earnings	Office Space Costs	Malpractice Costs	Other Costs
All Physicians	**2,875**	**56.7 %**	**17.3 %**	**7.6 %**	**5.5 %**	**12.9 %**
Medical Specialties						
General/family practice	374	47.8	22.4	9.6	4.6	15.6
Internal medicine	329	50.9	20.8	9.0	3.9	15.4
Cardiovascular disease	117	61.5	15.8	7.2	4.2	11.3
Gastroenterology	127	60.2	16.9	7.4	3.6	11.9
Other medical specialties*	229	54.2	19.5	8.4	3.6	14.3
Surgical Specialties						
General surgery	193	59.0	14.1	7.1	9.5	10.3
Cardiothoracic surgery	118	65.4	12.6	5.0	8.7	8.3
Orthopedic surgery	120	53.9	20.3	7.6	7.2	11.0
Ophthalmology	132	53.2	20.7	8.4	3.3	14.4
Urologic Surgery	158	57.8	14.9	7.7	6.4	13.2
Obstetrics/Gynecology	235	51.4	17.8	7.1	10.8	12.9
Other surgical specialties**	153	53.0	18.2	9.0	7.1	12.7
Other Specialties						
Psychiatry	186	71.5	8.5	8.2	2.6	9.2
Anesthesiology	158	73.1	9.4	1.5	8.7	7.3
Radiology	122	67.8	11.4	3.5	3.9	13.4
Other specialties***	124	69.5	11.4	4.1	3.8	11.2

*Other medical specialties consists primarily of pediatrics, allergy, and dermatology.

**Other surgical specialties consists primarily of neurosurgery, plastic surgery, and otorhinolaryngology.

***Other specialties consists primarily of pathology, emergency medicine, and neurology.

NOTE: Data are for self-employed physicians; cost shares are weighted by sample weights.

SOURCE: 1988 Physicians' Practice Costs and Income Surveys.

cost shares. The GPCI for each geographic area calculated using national cost shares was then compared to the GPCI calculated using specialty specific shares. The specialty with the greatest mean difference between payments under the two sets of calculations is obstetrics/gynecology -- on average payments would be 1.7 percent different for OBGs using the specialty based cost shares. Medical specialties tend to have the smallest mean differences; for example, the mean difference for internal medicine is 0.4 percent and for cardiology is 0.5 percent. Thus, the authors conclude that the payment differentials resulting from the use of specialty-specific shares would be minor and not justify the administrative burden of calculating and applying specialty-specific cost shares.

1.2.2 Cost Shares Based on Geographic Location

Table A-3 shows the variation in cost shares by practice location, not controlling for specialty. The differences are always much less than differences among specialties. Rural practices spend disproportionately more on employees and supplies, leaving the physician with a smaller share. Variation by Census Division is shown in the bottom panel of Table A-3. West North Central and New England practices return the least to physicians, but for different reasons (which could be confounded with specialty). New England practices spend proportionately more on office space and malpractice premiums versus West North Central physicians, who tend to spend more on ancillary staff and supplies.

MANOVA tests of statistically significance indicate that urban and rural cost shares cannot be aggregated. The test results in the nine Census Divisions again indicate that these shares are statistically different and should not be aggregated.

To determine whether the differences between the GPCIs computed with area-specific cost shares and the GPCIs computed with national cost shares are meaningful, the absolute value of the difference between each area-specific GPCI and the national GPCI were calculated for each geographic area. The difference between the urban-cost-weighted GPCI and the national GPCI never exceeds 0.2 percentage points for any of the 317 MSAs. The rural GPCI never differed from the national GPCI by more than 0.4 percentage points for any of the 49 rural areas. Thus, the effects of using the urban-rural shares are quite small.

The absolute differences between the divisional GPCIs and the national GPCI are slightly larger, although the largest mean difference is still only 0.3 percentage points. The largest difference for any areas is 1.1 percentage point which occurs for Nassau-Suffolk, New York. The higher shares for office space and malpractice premiums, coupled with the

TABLE A-3

PHYSICIAN PRACTICE COST SHARES BY LOCATION: U.S., URBAN/RURAL, AND CENSUS DIVISION

	N	Physician Earnings	Non-physician Employee Earnings	Office Space Costs	Malpractice Costs	Other Costs
All Physicians	**2,875**	**56.7 %**	**17.3 %**	**7.6 %**	**5.5 %**	**12.9 %**
Urban	**2,143**	**57.1**	**17.0**	**7.7**	**5.5**	**12.7**
Rural	**732**	**54.8**	**19.2**	**6.7**	**5.4**	**13.9**
Census Division						
New England	167	54.7	18.7	8.7	6.1	11.8
Middle Atlantic	417	58.2	15.3	7.7	6.7	12.1
East North Central	421	57.3	17.0	7.3	5.6	12.8
West North Central	203	53.4	20.8	7.0	5.2	13.6
South Atlantic	524	57.0	17.4	7.6	5.1	12.9
East South Central	192	56.1	19.2	7.0	5.0	12.7
West South Central	301	57.1	18.1	7.4	4.2	13.2
Mountain	166	56.6	16.2	6.6	4.8	14.8
Pacific	484	56.3	17.4	7.9	5.2	13.2

NOTE: Data are for self-employed physicians; cost shares are weighted by sample weights.

SOURCE: 1988 Physicians' Practice Costs and Income Surveys.

extremely high costs for these inputs in Nassau-Suffolk, translate to a higher GPCI using the Northeast-specific weights. No other divisional GPCI differs by more than 0.7 percentage points from the 1988 national GPCI.

1.2.3 Group Size

Pope and Burge (1992) examined the share of overhead expenses to gross revenue and the shares of practice overhead expenses in total overhead expenses by group size. They used 1988 PPCIS data. Overhead expenses as a share of gross revenues are not statistically different between solo and group physicians for 11 of 16 specialties. Solo physicians have a significantly higher overhead percentage in several hospital-oriented specialties, but this may be due to free inputs received by group physicians from hospitals. Overall, there is little evidence that the share of overhead costs versus physician net income is different by group size.

However, shares of specific cost components in total overhead expenses do vary by solo versus group practice. The nonphysician labor share is higher for groups, and the office rental share is lower. Group physicians also tend to have lower medical equipment, automobile and continuing education expense shares. Group miscellaneous costs, however, are a higher share of total expenses.

For many specialties, the differences in the shares of overhead expense components between solo and group physicians are a few percentage points. This is not enough to cause a significant difference in GPCI values. Even where more substantial differences in shares by group size exist, it is not clear that calculating different GPCIs for different size practices is warranted. Group size is a choice of physicians and differentiating payments by group size may affect physician behavior in undesirable ways. For example, incentives might be established for physicians to form or dissolve group practices merely to obtain higher Medicare reimbursement.

1.3 Conclusions

Computing SMS shares from the actual SMS data tape would allow certain refinements in data editing and cost share calculation procedures. However, our sensitivity analysis using the PPCIS data indicates that changes in the GPCI index values resulting from different cost shares methodologies are inconsequential. Thus, the added administrative

burden of working with the actual data tape is not justified by improvements in the GPCI. Similarly, differences implied by specialty -- or area-specific cost shares do not justify the added complexity and administrative burden of calculating and applying multiple sets of shares.

APPENDIX B

UPDATING GPCI COST SHARES

The current GPCI cost shares are based on published data from the 1987 SMS. As the geographic price indexes are updated it is also desirable to update cost shares to reflect temporal changes in physician expenses and income. As discussed earlier, one advantage of data from the AMA's Socioeconomic Monitoring System is that data are collected annually, and no major changes have been made recently to the survey instrument. Thus, SMS data will readily support updates of the cost shares.

The top panel of Table B-1 presents SMS cost shares for physician expenses in each year from 1982 through 1990. From this table it is clear that some updates of cost shares are necessary. For example, if the cost shares from 1982 were used (and not updated) the increasing share of physician expenditures on malpractice premiums during the decade would be missed. However, it seems clear from these shares that there is some random movement in cost shares. This is particularly evident in the cost share for other expenses from 1982 through 1988, with the shares rising by 1.5 percentage points (1985 to 1986) and then falling by 1.3 percentage points (1986 to 1987).

Four options for updating the cost shares would be:

1. updating annually with the most recent data;
2. updating annually with an average of recent data;
3. updating periodically with the most recent data; and
4. updating periodically with an average of recent data.

If changes in cost shares from year to year reflected changes in physician expenditure patterns perfectly, the option 1 would provide the most up-to-date accurate payment. However, this option has two disadvantages. First, while it is desirable for cost shares to reflect legitimate trends in physician cost shares, updating annually could cause fluctuations in cost shares caused by random variations in cost components. As was shown above, some cost shares seem to reflect random movements in expenses, rather than real trends across

TABLE B-1

COST SHARES FOR SELF-EMPLOYED PHYSICIANS

SMS Data	Physician Earnings	Non-Physician Earnings	Office/ Rental Dep.	Medical Supplies	Malpractice Premiums	Medical Equipment	Other
1990	55.3 %	16.2 %	10.0 %	4.9 %	4.3 %	2.3 %	7.0 %
1989	54.2	16.3	10.3	5.3	4.8	2.3	6.9
1988	53.2	16.1	11.3	4.8	5.3	2.3	7.0
1987	54.2	15.7	11.1	5.0	5.6	2.4	6.0
1986	52.5	15.6	11.4	5.3	5.1	2.8	7.3
1985	54.8	15.7	11.6	4.9	4.6	2.6	5.8
1984	55.8	14.7	11.5	5.0	4.0	2.6	6.5
1983	57.6	14.4	10.5	4.6	3.4	2.5	5.9
1982	58.2	16.1	9.5	4.1	3.1	2.7	6.4

3-Year Average	Physician Earnings	Non-Physician Earnings	Office/ Rental Dep.	Medical Supplies	Malpractice Premiums	Medical Equipment	Other
1988-1990	54.2 %	16.2 %	10.5 %	5.0 %	4.8 %	2.3 %	7.0 %
1987-1989	53.8	16.0	10.9	5.0	5.2	2.4	6.6
1986-1988	53.3	15.8	11.3	5.0	5.3	2.5	6.8
1985-1987	53.8	15.7	11.4	5.1	5.1	2.6	6.3
1984-1986	54.4	15.3	11.5	5.1	4.6	2.7	6.5
1983-1985	56.1	14.9	11.2	4.9	4.0	2.6	6.4
1982-1984	57.2	15.0	10.5	4.6	3.5	2.6	6.6

SOURCE: Socioeconomic Characteristics of Medical Practice, AMA, 1983-1991, eds.

time. Selecting option 2, updating annually with an average of several years worth of data could minimize random variations. For example, the bottom panel of Table B-1 gives cost shares based on three year averages of data. Much of the random fluctuations has been removed, although shares now may lag behind legitimate trends in expenses.

A second problem with updating yearly is the additional administrative costs that will be incurred. The physician payment system is not simple; updating the cost shares annually will complicate the jobs of those administering the system and make the determination of payments more difficult for physicians to understand. The resulting changes in payments to physicians will be quite small, but these changes will need to be implemented and explained.

Update options 3 and 4 call for periodic updates of the cost shares. Using this strategy will eliminate the administrative burden of annual updates; however, it implies that cost shares used for payment calculations may not reflect the most recent patterns in physician expenditures. Like option 1, option 3 may result in cost shares with some random deviations from true shares, while cost shares computed under option 4 (like option 3) will lag in measuring expense and income trends.

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